

WHO IS RESPONSIBLE FOR LIMITING ORBITAL DEBRIS (OD) GENERATION?

1. **Program Managers** ensure that an OD assessment is conducted.
2. **Office of Safety and Mission Assurance (OSMA)** provides the policies and requirements to be used for assessing the potential of generating OD and the possible risks.
3. **Chief Safety and Mission Assurance Officer** trains program/project personnel regarding these OD policies and procedures.
4. **Office of External Relations** provides appropriate OD mitigation strategies and requirements in negotiated international agreements for space activities and launch services.
5. **NASA Contract, Grant, Cooperative Agreement, or Other Agreement Officer** incorporates these policies and requirements, as appropriate, into the governing agreements.



Main propellant tank of the second stage of a Delta 2 launch vehicle landed near Georgetown, Texas.



YOUR PREPAREDNESS FOR AN AUDIT OF LIMITING ORBITAL DEBRIS GENERATION REQUIREMENTS WITH THESE SAMPLE AUDIT GUIDE QUESTIONS.

MANAGEMENT:

1. Did your program perform, or are you planning to perform, an OD Assessment prior to the PDR? And, 45 days prior to the CDR?
2. Did you receive support from resources at JSC and Kennedy Space Center for your OD Assessment?
3. Where has the Mission AA shown approval of your OD Assessment?
4. How have you included in your design an end-of-mission plan?
5. How have you ensured that each OD assessment addresses all of the correct areas of concern?
6. What approvals are required for all non-compliances?
7. Where is the process for notification prior to any significant spacecraft operational or end-of-mission maneuvers?

GENERAL:

1. How have program/project personnel made aware of and understand OD policies and standards?
2. Who in NASA tracks all orbital debris and maintains a list of reentry dates?
3. What approvals are required for all non-compliances?

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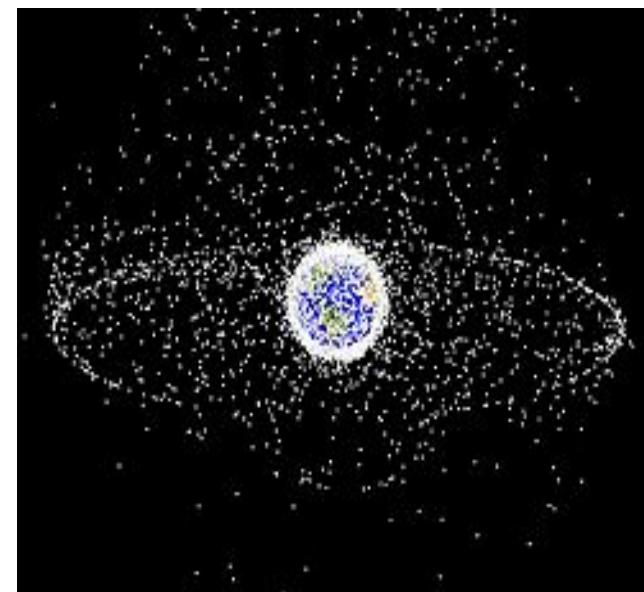


NASA
SAFETY AND MISSION
ASSURANCE
REQUIREMENTS

NPD 8710.3

Limiting Orbital Debris Generation

Compliance Verification Guide



OFFICE OF SAFETY AND
MISSION ASSURANCE

This brochure is intended to be used as a guide only, not as a replacement for the actual policy. To review the NASA Policy for Limiting Orbital Debris Generation (NPD 8710.3) in its entirety, see <http://www.hq.nasa.gov/office/codeq/doctree/texttree.htm>

What is Orbital Debris (OD)?

OD refers to man-made items, such as fragments of rocket bodies, stray nuts/bolts lost on space walks, paint chips, and all other leftovers from human activity.

What is the principal source of large OD?

Satellite explosions, especially old upper stages left in orbit with stored energy sources constitute the largest component of cataloged orbital debris.

How much OD is currently in Earth orbit?

Over 9,000 objects larger than 10 cm are known to exist. The estimated population of particles between 1 and 10 cm in diameter is greater than 100,000. The number of particles smaller than 1 cm exceeds tens of millions.

Why should we limit OD?

To ensure the safety of astronauts, the public, and the environment, and enable future space mission success.



Ms. Lottie Williams of Tulsa, Oklahoma reported that she was struck on the shoulder by debris while walking.

MINIMUM AUDIT POINTS FOR NPD 8710.3

OD Assessments

- OD Assessments are conducted for OD generation from mission hardware in planned Earth orbit as a result of: normal operations, accidental explosions, intentional breakups, on-orbit collisions, and disposal of space systems after mission completion, structural components impacting the earth following post-mission disposal by atmospheric reentry.
 - **Objective Quality Evidence (OQE) – OD Assessment Content**
- **Program/Project Managers** conduct OD Assessments prior to Preliminary Design Review (PDR) and 45 days prior to Critical Design Review (CDR).
 - **OQE – Dated OD Assessment**
- **OSMA, the Office of Space Operations, the responsible Mission Associate Administrator (AA), and the Director of Johnson Space Center (JSC)** review the OD assessment.
 - **OQE - OD Assessment signed by identified offices, JSC-provided**

End-of-Mission Plan

- **Program/Project Managers** design for end-of-mission disposal, developing an end-of-mission plan.
 - **OQE - End-of-Mission Plan**
- **Director of JSC** and the responsible Mission AA review the end-of-mission plan.
 - **OQE - End-of-Mission Plan signed by identified offices**

Background: Delta 2 second stage reentered in 2000. Three objects were recovered: the main stainless steel propellant tank, a titanium pressurant tank, and a portion of the main engine nozzle assembly.

Non-Compliance

- **Program/Project Managers** justify each non-compliance to the responsible Mission AA by providing a cost analysis or requirements analysis that documents the impact of full compliance and any unique risks of noncompliance.
 - **OQE – Non-compliance Justification**
- **The Responsible Mission AA** reviews each non-compliance.
 - **OQE – Non-compliance Justification signed by Mission AA**

Possible Public Impacts

- **Director of JSC** maintains a list of predicted reentry dates for NASA spacecraft along with their associated orbital stages.
 - **OQE - NASA Spacecraft Reentry Date List**
- **Program/Project Managers** implement OD mitigation measures for all mission hardware in Earth orbit.
 - **OQE - Completed OD Mitigation Action List**
- **The Office of Public Affairs** distributes timely and accurate information about NASA spacecraft reentries to the public.
 - **OQE - Public Communication Procedures**
- **Program/Project Managers** communicate with the Cheyenne Mountain Operations Center prior to significant spacecraft operational or end-of-mission maneuvers.
 - **OQE - Cheyenne Mountain Operations Center Communication Procedures**